

**IDAHO DEPARTMENT OF FISH AND GAME  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ANNUAL REPORT  
PERMIT NO. 1120  
REPORT PERIOD: JANUARY 1, 2003 TO DECEMBER 31, 2003**

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## **INTRODUCTION**

This report satisfies the requirement for an annual reporting of “take” as specified in Permit No. 1120 (formerly Permit No. 795) issued to the Idaho Department of Fish and Game (IDFG) by the National Oceanic and Atmospheric Administration (NOAA) under the Endangered Species Act of 1973, as amended. Permit No. 1120 covers research and enhancement activities associated with IDFG's sockeye salmon *Oncorhynchus nerka* captive broodstock program including: 1) adult sockeye salmon trapping on Redfish Lake Creek and the upper Salmon River at IDFG's Sawtooth Fish Hatchery, 2) smolt trapping on Redfish Lake Creek and the upper Salmon River at the Sawtooth Fish Hatchery, 3) residual sockeye salmon trapping and spawner enumeration in Redfish Lake, 4) adult sockeye salmon telemetry and spawner enumeration in Redfish Lake, 5) broodstock and production rearing at IDFG's Eagle Fish Hatchery and Sawtooth Fish Hatchery, 6) egg and fish transfers between NOAA/IDFG facilities and Sawtooth Valley waters, and 7) eyed-egg, juvenile, and adult releases to Sawtooth Valley waters. Reporting for activities conducted at NOAA Burley Creek Fish Hatchery and/or the NOAA Manchester Research Station is the responsibility of NOAA (Permit 1005) and will appear under separate cover.

## **SMOLT TRAPPING AND OUT-MIGRATION IN 2003**

### **Redfish Lake**

The out-migrant trap on Redfish Lake Creek is used to estimate the number of wild/natural and hatchery-produced sockeye salmon smolts emigrating from Redfish Lake. The trap is located 1.4 km downstream from the lake outlet and was operated from April 15 to May 29 in 2003. Personnel from IDFG checked the trap twice daily.

All sockeye salmon captured at the trap were anesthetized and scanned for PIT tags. Up to 30 wild/natural and hatchery-produced sockeye salmon smolts (2,228 total) were PIT tagged each day and measured for fork-length (1 mm) and weight (0.1 g). Hatchery-produced sockeye salmon captured at the trap in 2003 originated from an October 2002 release of 61,500 fall direct-released presmolts (reared at Sawtooth Fish Hatchery) and an August 2002 release of 45,001 summer direct-released presmolts (reared at Oregon Department of Fish and Wildlife's Bonneville Fish Hatchery). To estimate trapping efficiency, Passive Integrated Transponder (PIT) tagged sockeye salmon smolts were released approximately 250 m upstream of the weir one-half hour after sunset. Smolts that did not receive PIT tags and recaptured PIT-tagged smolts were released downstream of the weir one-half hour after sunset. Flow-through live boxes with locking lids were used to hold fish until the evening release.

Smolt out-migration peaked on May 12, 2003 (Figure 1). A total of 2,611 wild/natural, 2,699 fall direct-released and 2,024 summer direct-released hatchery-produced sockeye salmon were captured between April 15 and May 29. Trapping efficiency varied with stream flow. Out-migrant run size was estimated at 4,637 wild/natural fish, 6,874 fall direct-released fish and 5,352 summer direct-released fish. Fork-lengths and weights averaged 115 mm and 13.7 g for wild/natural out-migrants, 124 mm and 16.8 g for fall direct-released out-migrants, and 127 mm and 17.3 g for summer direct-released out-migrants. In 2003, no out-migrants were taken into the captive broodstock program. We had zero mortalities associated with PIT tagging or handling. However, there were four trap-related mortalities of hatchery-produced sockeye salmon and two mortalities of wild sockeye salmon smolts associated with high discharge periods (0.08% of total number of fish handled).

Thirty-five Chinook salmon smolts and eight steelhead smolts were captured at the Redfish Lake Creek trap in 2003.

### **Alturas and Pettit Lakes**

Out-migrant trapping activities on Alturas Lake Creek and Pettit Lake Creek were conducted by the Shoshone-Bannock Tribes and are covered by separate NOAA Permits. Results of their activities appear under separate cover. Hatchery-produced smolts that emigrated from Alturas Lake in 2003 originated from an August 2002 release of 6,123 summer direct-released presmolts (reared at Bonneville Fish Hatchery). Hatchery-produced smolts that emigrated from Pettit Lake in 2003 originated from an August 2002 release of 7,805 summer direct-released presmolts (reared at Bonneville Fish Hatchery) and an October 2002 release of 19,981 fall direct-released presmolts (reared at Sawtooth Fish Hatchery). All presmolts were released at a mid-lake location. Two wild/natural and 299 hatchery-produced sockeye salmon smolts were intercepted at the out-migrant trap operated by IDFG on the upper Salmon River between May 17 and July 4, 2003. Thirty-two hatchery-produced sockeye salmon presmolts were intercepted between October 10 and October 22, 2003 following the October 6 presmolt releases to Pettit and Alturas lakes. No attempt was made to estimate out-migration at this location.

### 2003 Outmigration at RLCTRP

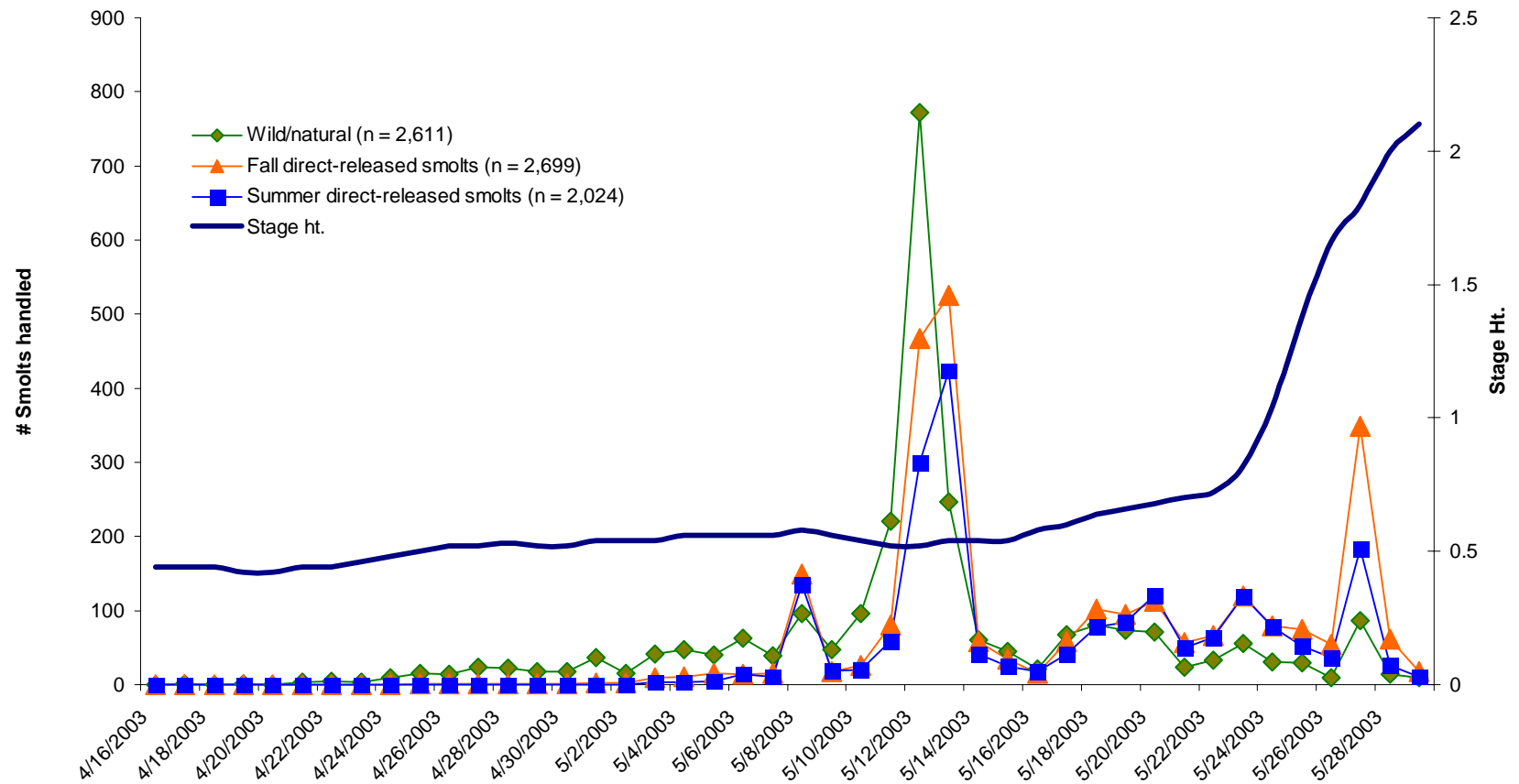


Figure 1. Daily trap capture of wild/natural and hatchery-produced sockeye salmon smolts (unexpanded) at the Redfish Lake Creek Trap for the 2003 out-migration year.

## **ADULT TRAPPING ACTIVITIES IN 2003**

Two adult traps are used to capture returning anadromous sockeye salmon in the Sawtooth Valley. The first trap is located on Redfish Lake Creek approximately 1.4 km downstream from the lake outlet and was operated from July 10 to September 25, 2003. The second trap is located on the upper Salmon River at the Sawtooth Fish Hatchery weir and was operated from June 12 to September 9, 2003.

In 2003, three anadromous sockeye salmon returned to the Sawtooth Valley. Traps on Redfish Lake Creek and the upper Salmon River at the Sawtooth Fish Hatchery intercepted two and zero adults, respectively. Additionally, one adult sockeye salmon was observed immediately downstream of the Sawtooth Fish Hatchery trap but was not handled. Fish were captured between August 1 and August 18, 2003. The trapped adult sockeye salmon (both female) were adipose fin-clipped, indicating returns from a calendar year 2000 presmolt release to either Redfish, Alturas, or Pettit lakes. A summary of adult returns is presented in Table 1.

In 2003, three adult Chinook salmon (one unmarked female, one unmarked male, and one unmarked jack) were captured at the Redfish Lake Creek trap and released above the weir. One unmarked jack mortality was discovered on top of the trap box on July 27, 2003.

## **RESIDUAL SOCKEYE SALMON TRAPPING/ENUMERATION ACTIVITIES IN 2003**

There were no residual sockeye salmon trapping activities conducted in 2003. Snorkeling for residual sockeye salmon enumeration in Redfish Lake was conducted weekly from October 1 to October 27, 2003. The peak of the residual count occurred on October 21 when 18 residuals were observed at the area commonly known as Sockeye Beach.

## **TELEMETRY INVESTIGATIONS IN 2003**

On September 16 and 17, 2003, anadromous and hatchery-reared maturing adult sockeye salmon were released to Redfish Lake. Prior to release, eight male sockeye salmon (4 reared at Eagle Fish Hatchery and 4 reared at NOAA Manchester Research Station) were implanted with radio transmitters. Telemetry investigations of adult locations began on September 23 and continued weekly through November 10, 2003. Fish locations were recorded at least weekly by boat tracking. The first area of excavation was located at the south end of the lake on October 6. The final redd survey was conducted on November 10. A total of forty-two areas of excavation (possible redds) were identified. Twenty-nine areas of excavation were located at the south end of the lake on the opposite shore from the United States Forest Service Transfer

Table 1. Year 2003 anadromous sockeye salmon adult return summary.

Summary Category	Total Number Trapped	Number Trapped at Redfish Lake Cr.	Number Trapped at Sawtooth Fish Hatchery
All Anadromous Adults	2	2	0
Anadromous Males	0	0	0
Anadromous Females	2	2	0
Un-Marked Adults	0	0	0
Adipose-Clipped Adults <sup>a</sup>	2	2	0

<sup>a</sup> Adipose-clipped adults are presumably from a fall presmolt release from fish reared at Sawtooth Fish Hatchery in 2000. Age data for these adults is not complete; confirmation of origin is pending.

Camp dock, and 13 areas of excavation were located at the slide area west of the Transfer Camp dock. Areas of excavation (possible redds) are typically large (~ 3 m x 3 m) and may represent multiple spawning events by multiple parents; therefore, we do not know how many parents contributed to potential natural production in 2003.

## **PERFORMANCE OF CULTURED GROUPS IN 2003**

During this reporting period, five broodstock and two production groups were in culture at IDFG facilities representing brood years 1999, 2000, 2001, 2002 and 2003. Summaries of losses, while in culture during this reporting period, are presented in Tables 2 and 3. Culture groups developed to meet future spawning needs are designated as “broodstock” groups. Culture groups developed primarily for reintroduction to Sawtooth Valley waters are designated as “production” groups. The year of development for specific culture groups may appear abbreviated (e.g., BY99 refers to brood year 1999).

### **BY99 Broodstock**

Eleven families, represented by 30 unique sub-families, were developed from brood year 1999 broodstock spawn crosses at the Eagle Fish Hatchery. The BY99 broodstock group was developed using male and female sockeye salmon from the BY96 and BY97 broodstocks (see Appendix A for specific broodstock lineage descriptions). Initial inventory for this reporting period included eight fish. Seven males were utilized in hatchery spawn crosses in 2003. At the end of this reporting period, zero BY99 broodstock remained in culture at the Eagle Fish Hatchery (Table 2).

### **BY00 Broodstock**

Approximately 900 eyed-eggs representing ten families (54 unique sub-families) were retained from spawn crosses performed in 2000 to create the BY00 broodstock. The BY00 broodstock group was developed using male and female sockeye salmon from the BY97 and BY98 broodstocks (see Appendix A for specific broodstock lineage descriptions). Initial inventory for the BY00 broodstock at Eagle Fish Hatchery was 339 fish. Two hundred twenty-nine females and 95 males matured at age-3 in 2003. Thirty-five maturing sockeye adults (25 females and 10 males) were released to Redfish Lake on September 17, 2003. One hundred ninety-six females and 81 males were utilized in hatchery spawn crosses. At the end of this reporting period, five BY00 broodstock remained in culture at the Eagle Fish Hatchery (Table 2).

### **BY01 Broodstock**

Approximately 870 eyed-eggs representing eleven families (50 unique sub-families) were retained from spawn crosses made in 2001 to create the BY01 broodstock. The BY01 broodstock group was developed using male and female sockeye salmon from the BY98 broodstock, male sockeye salmon from the BY99 broodstock and nine (two females and seven males) of the 26 anadromous adults that returned to the Sawtooth Valley in 2001 and were retained for spawning (see Appendix A for specific broodstock lineage descriptions). Initial inventory for the BY01 broodstock at Eagle Fish Hatchery was 323 fish. Eleven females and 65 males matured as age-2 fish in 2003, with all but four males utilized in 2003 spawn crosses. At the end of this reporting period, 235 BY01 broodstock remained in culture (Table 2).

### **BY02 Production**

Two hundred forty-seven spawn crosses representing 89 females and 115 males were developed for brood year 2002 production spawn crosses at the Eagle Fish Hatchery. The BY02 production group was developed using male sockeye salmon from the BY98, BY99, and BY00 broodstocks and female sockeye salmon from the BY99 and BY00 broodstocks. Specific crosses performed to develop production groups included: 1) BY99 females x BY98 males and 2) BY99 females x BY99 males 3) BY99 females x BY00 males and 4) BY00 females x BY99 males. Approximately 65,838 eyed-eggs were produced from BY02 spawn crosses at Eagle Fish Hatchery. Initial inventory for BY02 production fish at Sawtooth Fish Hatchery was 94,483 developing fry. Presmolts were released to Redfish Lake (59,810 presmolts), Alturas Lake (2,017 presmolts), and Pettit Lake (14,961 presmolts) on October 6 and 7, 2003. At the end of this reporting period, 199 BY02 production fish remained in culture at the Sawtooth Fish Hatchery for an overwinter smolt survival study (Table 3).

### **BY02 Broodstock**

Approximately 840 eyed-eggs were segregated from production groups described above to create the BY02 broodstock representing 79 unique females and 106 unique males. Genetic profiling from microsatellite markers will be utilized to establish BY02 pedigrees for future spawn crosses. Initial inventory for the BY02 broodstock at Eagle Fish Hatchery was 420 fish. At the end of this reporting period, 339 fingerlings were in culture at Eagle Fish Hatchery (Table 2).

### **BY03 Production**

Five hundred ninety-five spawn crosses representing 209 females and 140 males were developed for brood year 2003 production spawn crosses at the Eagle Fish Hatchery. The BY03 production group was developed using male sockeye salmon from the BY99, BY00, and BY01 broodstocks and female sockeye salmon from the ANH03 (2003 hatchery-produced anadromous returns), BY00, and BY01 broodstocks. Specific crosses performed to develop production groups included: 1) ANH03 females x BY99 males, 2) ANH03 females x BY00 males, 3) ANH03 females x BY01 males, 4) BY00 females x BY99 males, 5) BY00 females x BY00 males, 6) BY00 females x BY01 males, and 7) BY01 females x BY00 males. Approximately 303,983 eyed-eggs were produced from BY03 spawn crosses at Eagle Fish Hatchery. Eagle Fish Hatchery transferred 113,663 BY03 production eggs to the Sawtooth Fish Hatchery on November 19, November 25, and December 3, 2003 (Table 3). Approximately 86,342 eyed-eggs were transferred from the NOAA Burley Creek Hatchery to the Sawtooth Fish Hatchery on November 19 and November 25, 2003. Initial inventory at Sawtooth Hatchery was 200,005 eyed-eggs. Eyed-eggs were also produced for the egg box program in Pettit Lake (149,966) and Alturas Lake (49,700) and distributed as follows: 1) Eagle Fish Hatchery released 138,304 eyed-eggs to Pettit Lake on November 25 (70,795 eyed-eggs), December 3 (45,451 eyed-eggs) and December 10 (22,058 eyed-eggs), 2) NOAA Fisheries transferred 11,662 eyed-eggs to Eagle Fish Hatchery for release into Pettit Lake on November 25, 2003, 3) Eagle Fish Hatchery released 8,428 eyed eggs on December 10, 2003 to Alturas Lake, and 4) NOAA Fisheries transferred 41,272 eyed eggs for release to Alturas Lake on December 10, 2003. Eagle Fish Hatchery retained 42,249 eyed-eggs for either a fall 2004 presmolt program or transfer to Sawtooth Fish Hatchery for a spring 2005 smolt program. Approximately 502 eyed-eggs were transferred to NOAA Fisheries on November 19 and December 3, 2003 to be reared to adult for release into Sawtooth Valley lakes in 2005 and 2006. Ending inventory of the BY03 production group was 197,965 and 42,235 developing eyed-eggs/ fry at Sawtooth Fish Hatchery and Eagle Fish Hatchery, respectively (Table 3).

### **BY03 Broodstock**

Approximately 837 eyed-eggs were segregated from production groups described above to create the BY03 broodstock representing 208 unique females and 140 unique males. Genetic profiling from microsatellite markers will be utilized to establish BY03 pedigrees for future spawn crosses. Approximately 419 eyed-eggs were transferred to NOAA facilities on November 19 and December 3, 2003 where they will remain through maturation (Table 2). The majority of BY03 broodstock adults produced at NOAA facilities will contribute to future spawning designs. Inventory reporting for these fish will appear under separate cover by NOAA. Ending inventory of BY03 broodstock at Eagle Fish Hatchery is 418 developing eyed-eggs/fry (Table 2).



Table 2. Summary of losses and magnitude of mortality for five captive sockeye salmon broodstocks reared at IDFG facilities and anadromous returns in 2003.

	Culture Groups					
	ANHBY03	BY99	BY00	BY01	BY02	BY03
Starting Inventory (January 1, 2003)	0	8	339 <sup>a</sup>	323	420	837 <sup>b</sup>
<u>Eyed-Egg to Fry</u>						
Undetermined <sup>c</sup>	Na	na	na	na	68	na
<u>Mechanical Loss</u>						
Handling	0	0	0	0	0	na
Jump-out	0	0	0	0	0	na
Transportation	0	0	0	0	0	na
<u>Non-infectious</u>						
Lymphosarcoma	0	0	0	0	0	na
Nephroblastoma	0	0	0	0	0	na
Other <sup>d</sup>	0	1	10	12	13	na
<u>Infectious</u>						
Bacterial	0	0	0	0	0	na
Viral	0	0	0	0	0	na
Other	0	0	0	0	0	na
<u>Maturation Spawners</u>						
Mature Males	0	7	81	61	0	na
Mature Females	2	0	196	11	0	na
<u>Maturation Non-Spawners</u>						
Mature Males	0	0	4 <sup>e</sup>	4	0	na
Mature Females	0	0	8	0	0	na
<u>Relocation</u>						
Transferred In	0	0	0	0	0	na
Transferred Out	0	0	0	0	0	419 <sup>f</sup>
Planted/Released	0	0	35	0	0	na
Ending Inventory (December 31, 2003)	0	0	5	235	339	418

<sup>a</sup> Starting inventory reflects an inventory adjustment made post-completion of the 2002 NOAA Annual Report.

<sup>b</sup> December 2003 developing fry and egg numbers.

<sup>c</sup> Typical egg to fry mortality includes non-hatching eggs, abnormal fry, and swim-up loss.

<sup>d</sup> Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.

<sup>e</sup> Includes one mature male mortality post ultra-sound handling.

<sup>f</sup> Transferred from IDFG Eagle Fish Hatchery to NOAA for broodstock rearing.

Table 3. Summary of losses and magnitude of mortality for two captive sockeye salmon production groups reared at IDFG facilities in 2003.

	Culture Groups		
	BY02 Sawtooth	BY03 Sawtooth	BY03 Eagle
Starting Inventory (January 1, 2003)	94,483 <sup>a</sup>	200,005 <sup>b</sup>	42,751 <sup>b</sup>
<u>Eyed-Egg to Fry</u> Undetermined <sup>c</sup>	15,093	2,040	14
<u>Mechanical Loss</u>			
Handling	0	na	na
Jump-out	0	na	na
Transportation	0	na	na
<u>Non-infectious</u>			
Lymphosarcoma	0	na	na
Nephroblastoma	0	na	na
Other <sup>d</sup>	2,403	na	na
<u>Infectious</u>			
Bacterial	0	na	na
Viral	0	na	na
Other	0	na	na
<u>Maturation</u>			
Mature Males	0	na	na
Mature Females	0	na	na
Other	0	na	na
<u>Relocation</u>			
Transferred In	0	86,342 <sup>e</sup>	na
Transferred Out	0	0	502
Planted/Released	76,788	0	na
Ending Inventory (December 31, 2003)	199	197,965 <sup>f</sup>	42,235

<sup>a</sup> December 2002 developing fry and egg numbers (combined NOAA and Eagle numbers).

<sup>b</sup> December 2003 developing fry and egg numbers (combined NOAA and Eagle numbers).

<sup>c</sup> Typical egg to fry mortality includes non-hatching eggs, abnormal fry, and swim-up loss.

<sup>d</sup> Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.

<sup>e</sup> Transferred from NOAA to IDFG Sawtooth Fish Hatchery for production rearing.

<sup>f</sup> Includes 113,663 and 86,342 eyed-eggs from Eagle and NOAA facilities, respectively.

## **2003 SPAWNING MATRIX**

The Idaho Department of Fish and Game is required by Permit No. 1120 to discuss proposed broodstock spawning matrices with NOAA Northwest Fisheries Science Center (NWFSC) genetics staff. In 2003, this was accomplished by distributing and discussing a proposed spawning matrix at the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC) held on September 11, 2003 in Stanley, Idaho (Appendix A). Representatives from NOAA Conservation Biology and Resource Enhancement and Utilization Technologies divisions (NWFSC) reviewed and approved the proposed spawning matrix. No objections to the proposed spawning design were aired.

## **YEAR 2003 SPAWNING ACTIVITIES**

Results from 2003 Eagle Fish Hatchery spawning activities are reviewed below. Results from spawning activities conducted by NOAA personnel at Washington State facilities will appear under separate cover by that agency. The year of development for specific broodstocks may appear abbreviated (e.g., BY96 refers to brood year 1996).

During the fall of 2003, seven age-4 fish (all male) from the BY99 broodstock, 324 age-3 fish (229 females and 95 males) from the BY00 broodstock, and 76 age-2 fish (11 females and 65 males) from the BY01 broodstock matured at the Eagle Fish Hatchery. In addition, the two anadromous females (ANH03) that returned to the Sawtooth Valley in 2003 were transferred to the Eagle Fish Hatchery and were incorporated into the spawning design.

## **2003 Production Spawning**

Two hundred-nine (209) females and 149 males were spawned at Eagle Fish Hatchery between October 10 and November 13, 2003 to generate 341,921 green eggs. To avoid inbreeding, spawn matrices were designed to outcross fish from different brood years (e.g., BY00 females spawned with BY01 males). When this was not possible, within brood year spawn crosses were made based on a desirability matrix designed to avoid or minimize inbreeding.

Five hundred ninety-five unique sub-families were developed from brood year 2003 production spawn crosses at the Eagle Fish Hatchery. To simplify tracking, families were grouped under one production group title: BY03. The BY03 production group was developed using female sockeye salmon from ANH03 (hatchery-produced anadromous adults, return year 2003), BY00, and BY01 broodstock, and male sockeye salmon from BY99, BY00, and BY01 broodstock. Specific crosses performed to develop this production group included: 1) ANH03 females x BY99 males, 2) ANH03 females x BY00 males, 3) ANH03 females x BY01 males, 4) BY00 females x BY99 males, 5) BY00 females x BY00 males, 6) BY00 females x BY01 males,

and 7) BY01 females x BY00 males. Spawn crosses produced approximately 341,921 green and 303,983 eyed-eggs. Brood year 2000 female fecundity averaged 1,656 green eggs per female and BY01 female fecundity averaged 1,102 green eggs per female. Egg survival to the eyed stage of development for the BY03 production group averaged 88.90% (median 95.02%) (Table 4).

Results for brood year 2003 spawn crosses conducted by NOAA will be reported under separate cover by that agency.

### **2003 Broodstock Spawning**

Approximately 418 eyed-eggs representing 208 unique females and 147 unique males were selected from specific spawn crosses described above and incubated for future broodstock needs. In addition, a duplicate component of 419 eyed-eggs were selected and transferred to the NOAA Burley Creek Hatchery to found their 2003 broodstock group.

Historically, broodstock families were kept separated in individual tanks until PIT tagging and then pedigree information for the familial line was utilized to make spawn crosses. Future genetic identification of BY02 broodstock will be determined by utilizing microsatellite DNA markers. Spawn crosses represented in the Eagle Fish Hatchery broodstock are presented in Table 5.

### **CRYOPRESERVATION IN 2003**

No milt from maturing sockeye salmon was cryopreserved in 2003.

Table 4. Summary information for 2003 sockeye salmon spawning activities at Eagle Fish Hatchery.

Spawning Cross <sup>a</sup>		No. of Green Eggs Taken	No. of Eyed-Eggs	Mean Egg Survival to Eyed-Stage	Median Egg Survival to Eyed-Stage
Female	Male				
ANH03	BY99	770	760	98.70%	98.70%
ANH03	BY00	2,563	2,504	97.70%	97.48%
ANH03	BY01	1,822	1,778	97.59%	97.33%
BY00	BY99	29,465	26,082	88.52%	94.82%
BY00	BY00	192,136	170,839	88.92%	95.13%
BY00	BY01	103,044	90,460	87.79%	93.45%
BY01	BY00	12,121	11,560	95.37%	97.65%
TOTALS		341,921	303,983	88.90%	95.02%

<sup>a</sup> ANH03 refers to anadromous adults returning in 2003; BY99 refers to captive adults produced in spawn year 1999; BY00 refers to captive adults produced in spawn year 2000; and BY01 refers to captive adults produced in spawn year 2001.

Table 5. Parent family and number of eyed-eggs retained for brood year 2003 captive broodstock development at Eagle Fish Hatchery.

Family Cross <sup>a</sup>		No. of Eyed-eggs Retained for Eagle Broodstock
Female	Male	
ANH03	BY99	1
ANH03	BY00	4
ANH03	BY01	3
BY00	BY99	25
BY00	BY00	218
BY00	BY01	145
BY01	BY00	22
TOTAL		418

<sup>a</sup>ANH03 refers to anadromous adults returning in spawn year 2003; BY99 refers to captive adults produced in spawn year 1999; BY00 refers to captive adults produced in spawn year 2000; and BY01 refers to captive adults produced in spawn year 2001.

### FISH AND GAMETE TRANSFERS IN 2003

Eyed eggs and adult fish were transferred in 2003. In all cases, the required state transfer permits were acquired prior to shipping.

On November 25 and December 10, 2003, approximately 921 eyed-eggs from production/broodstock crosses were transferred from the Eagle Fish Hatchery to the NOAA Burley Creek Fish Hatchery. Fish that mature as a result of this transfer will be incorporated in future NOAA spawning designs and adult release programs.

On November 19 and 25, and December 3, 2003, approximately 113,663 eyed-eggs from production crosses were transferred from the Eagle Fish Hatchery to the Sawtooth Fish Hatchery. On November 19 and 25, 2003, approximately 86,342 eyed-eggs were transferred from the NOAA Burley Creek Hatchery to the Sawtooth Fish Hatchery. Fish that result from these transfers will be used for fall 2004 presmolt release strategies in Sawtooth Valley lakes. On November 25, 2003, approximately 11,662 eyed-eggs were transferred from the NOAA

Burley Creek Hatchery to the Eagle Fish Hatchery for the Pettit Lake egg box program. Eggs were transferred to Pettit Lake and placed in egg boxes on November 25, 2003. On December 10, 2003, approximately 41,272 eyed-eggs were transferred from the NOAA Burley Creek Hatchery to the Eagle Fish Hatchery for the Alturas Lake egg box program. Eyed-eggs were placed in egg trays and transferred to Alturas Lake for release on December 11, 2003.

On September 15 and 16, 2003, NOAA transferred 280 BY00 adults to Redfish Lake to be released for volitional spawning. No mortality was associated with the transportation.

### **PRODUCTION RELEASES MADE IN 2003**

Pursuant to Special Condition B. 9. of Permit No. 1120, IDFG received authorization from NOAA to carryout the following production releases of sockeye salmon in 2003 (Table 6). All sockeye salmon released were adipose fin-clipped.

#### **Adult Releases**

Maturing adult sockeye salmon were released to Redfish Lake in September 2003 for volitional spawning. On September 15 and 16, 48 and 232 (respectively) NOAA Manchester Research Station/Burley Creek hatchery-reared BY00 adults (mean weight 1,530.0 grams) were released. Additionally, 35 IDFG Eagle Fish Hatchery-reared BY00 adults (mean weight 1,500.0 grams) were released September 17, 2003. Efforts were made to release fish of equal sex ratios. Sex was determined by ultrasound performed on August 8, 2003. No anadromous adults were released in 2003.

#### **Presmolt Releases**

Presmolt releases to Sawtooth Valley lakes were conducted in October 2003 at mid-lake (pelagic) locations with the aid of a release barge on loan to IDFG from NOAA. All presmolts were from brood year 2002 and were reared at IDFG's Sawtooth Fish Hatchery. Presmolts from Sawtooth Fish Hatchery were adipose fin-clipped prior to release, with a representative number of fish PIT tagged for evaluation purposes. On October 6, 2003, Pettit Lake received 14,961 presmolts reared at the Sawtooth Fish Hatchery. Fish from this group were adipose fin-clipped (2,014 PIT tags) and had a mean weight of 10.7 grams per fish. On October 6, 2003,

Table 6. Sockeye salmon releases made to Sawtooth Valley waters in 2003.

Release Location	Strategy (Brood Year)	Release Date	Number Released	Number PIT-Tagged	Marks	Release Weight (g)	Rearing Location
Alturas Lake (direct lake)	presmolt (2002)	10/06/03	2,017	2,017	Ad	8.0	IDFG Sawtooth Fish Hatchery
Pettit Lake (direct lake)	presmolt (2002)	10/06/03	14,961	2,014	Ad	10.7	IDFG Sawtooth Fish Hatchery
Redfish Lake (direct lake)	presmolt (2002)	10/7/03	59,810	1,519	Ad	11.0	IDFG Sawtooth Fish Hatchery
Redfish Lake	adult (2000)	09/15/03	48	-	None	1,200.0	NOAA Burley Creek Hatchery
	(2000)	09/16/03	135	-	None	1,745.0	NOAA Burley Creek Hatchery
	(2000)	09/16/03	97	-	None	1,395.0	NOAA Manchester Marine Lab
	(2000)	09/17/03	35	-	None	1,500.0	IDFG Eagle Fish Hatchery
Pettit Lake	eyed-egg (2003)	11/25/03	11,662	-	None	-	NOAA Burley Creek Hatchery
	(2003)	11/25/03	70,795	-	None	-	IDFG Eagle Fish Hatchery
	(2003)	12/03/03	45,451	-	None	-	IDFG Eagle Fish Hatchery
	(2003)	12/10/03	22,058	-	None	-	IDFG Eagle Fish Hatchery
Alturas Lake	eyed-egg (2003)	12/11/03	41,272	-	None	-	NOAA Burley Creek Hatchery
	(2003)	12/11/03	8,428	-	None	-	IDFG Eagle Fish Hatchery

Note: Ad refers to adipose fin-clip.



an additional 2,017 (100% PIT tagged) adipose fin-clipped presmolts (mean weight 8.0 grams/fish) were released to Alturas Lake. On October 6 and 7, 2003, 59,810 presmolts (mean weight 11.0 grams/fish) were released to Redfish Lake (1,519 PIT tagged).

### **Eyed-egg Planting**

On November 25, December 3, and December 10, 2003, approximately 149,966 eyed-eggs were transferred to eyed-egg boxes and planted in Pettit Lake (11,662 from the NOAA eyed-eggs from Burley Creek Hatchery and 138,304 eyed-eggs from Eagle Fish Hatchery). On December 11, 2003, approximately 49,700 eyed-eggs were transferred to eyed-egg boxes and planted in Alturas Lake (41,272 eyed-eggs from the NOAA Burley Creek Hatchery and 8,428 eyed-eggs from the Eagle Fish Hatchery).

### **PATHOLOGY FINDINGS IN 2003**

The IDFG Eagle Fish Health Laboratory processed samples for diagnostic and inspection purposes from broodstock and production groups of sockeye salmon; anadromous adult sockeye salmon that were retained for hatchery spawning; sockeye salmon smolts obtained from out-migrant traps; and *O. nerka* obtained from trawl efforts. Forty-seven laboratory cases involving 466 individual fish were processed in 2003. The laboratory also summarized pathology findings to satisfy the needs of adjacent state agencies for issuance of sockeye salmon import and transport permits.

There was no evidence of viral pathogens in any of the production and broodstock groups in 2003, which was consistent with results from previous years. In addition, no viral pathogens were detected in the two anadromous adult female sockeye salmon examined in 2003. Mortality caused by infectious hematopoietic necrosis virus (IHNV) was observed in BY00 spring Chinook salmon in February of 2002 at Sawtooth Fish Hatchery; however, IHNV was not detected in sockeye salmon reared during the same time period in a nearby outside raceway. To investigate the presence of IHNV in spawned-out carcasses of Chinook salmon above the river water supply of the Sawtooth Fish Hatchery, carcasses of Chinook salmon were sampled in 2003. Sixty-three carcasses were examined and IHNV was not detected. This work was done to assist in a risk analysis of rearing sockeye salmon in the Sawtooth Fish Hatchery river water supply in the future. The Redfish Lake sockeye salmon population remains the only sockeye salmon population in the Pacific Northwest that does not have IHNV.

Clinical bacterial kidney disease (BKD), caused by *Renibacterium salmoninarum*, did not occur in any production groups of sockeye salmon juveniles reared at EAG or Sawtooth Fish Hatchery in 2003. Captive adult sockeye salmon spawned in 2003 were free of clinical levels of BKD; however, the enzyme-linked immunosorbent assay (ELISA) optical density (OD) levels of

two spawned captive sockeye salmon minimally exceeded background levels of BKD. Bacterial kidney disease antigen was not detected in either of the anadromous adult sockeye salmon examined in 2003. Additionally, BKD antigen was not detected in smolts collected during emigration from Redfish or Pettit Lake out-migrant trapping locations. Out-migrants from Alturas Lake were not collected for fish health sampling in 2003 due to the low number of smolts trapped at the Alturas Lake Creek out-migrant trap.

Furunculosis, caused by *Aeromonas salmonicida*, was detected in one of the two anadromous adult sockeye salmon post-spawning. The presence of *A. salmonicida* indicates the need for Oxytetracycline and Erythromycin injections shortly after adults are trapped.

The myxosporean parasite, *Myxobolus cerebralis*, which can cause salmonid whirling disease, is present in the upper Salmon River. *Oncorhynchus nerka* samples obtained by trawling in Redfish, Pettit, and Alturas lakes are examined annually for *M. cerebralis*. Alturas Lake samples were found to be positive for *M. cerebralis* (3 of 5 fish sampled) in 2003 using polymerase chain reaction (PCR) testing. In addition, a neurotropic *Myxobolus* species was detected (PCR testing) in both of the anadromous adult sockeye salmon that returned to Redfish Lake Creek in 2003. The Eagle Fish Health Laboratory continues to investigate infectivity of *M. cerebralis* in the river water supply of the Sawtooth Fish Hatchery using sentinel rainbow trout fry. Results are used to assess the risk of rearing sockeye salmon on river water during the winter months.

A myxosporean parasite, *Parvicapsula minibicornis*, was detected in both anadromous adult sockeye salmon in 2003. Detection of *P. minibicornis* was made by PCR at the lab of Dr. Simon Jones, Department of Fisheries and Oceans, Canada; however, histological confirmation was not obtained, which indicates that the infections were light. These results are similar to those obtained by Dr. Jones for sockeye salmon of the Fraser River in British Columbia, Canada. *Parvicapsula minibicornis* has been demonstrated to be contracted in the estuary before sockeye enter the Columbia River mainstem.

In 2003, the two anadromous adult sockeye salmon were examined for the presence of *Piscirickettsia salmonis* and *Ceratomyxa shasta*. The results were negative for both pathogens, indicating that *P. salmonis* and *C. shasta* have not become established in the upper Salmon River.

### **JUVENILE FISH QUALITY ASSESSMENT IN 2003**

In 1999, the SBSTOC recommended applying assessments of fish quality to juvenile sockeye salmon produced in this program to provide additional perspective on factors that may affect fish survival from outplanting through out-migration. General parameters considered for investigation included: 1) proximate body composition analysis, 2) organosomatic index, 3) fish health and 4) smoltification assay.

Year 2003 fish samples for proximate analysis are summarized in Table 7. Mean percent fat dry weight calculations are pending.

Table 7. Year 2003 juvenile *O. nerka* proximate body analysis summary.

Sample Date	Sample location	Description of fish sampled <sup>a</sup>	Number sampled	Mean wt. (g)	Mean FL (mm)	Mean % fat dry weight
01/29/03	Pettit Lake	Gill net, wild/natural <i>O. nerka</i>	5	17.1	118	<i>pending</i>
02/19/03	Pettit Lake	Gill net, wild/natural <i>O. nerka</i>	21	17.1	120	<i>pending</i>
01/29/03	Pettit Lake	Gill net, AD/RV sockeye salmon	1	19.9	125	<i>pending</i>
02/19/03	Pettit Lake	Gill net, AD/RV sockeye salmon	1	22.0	131	<i>pending</i>
May-2003	Pettit Lake Creek	Weir, AD out-migrant	23	18.8	126	<i>pending</i>
May-2003	Pettit Lake Creek	Weir, AD/RV out-migrant	25	24.8	141	<i>pending</i>
May-2003	Redfish Lake Creek	Weir, wild/natural out-migrant	21	14.7	117	<i>pending</i>
May-2003	Redfish Lake Creek	Weir, AD/RV out-migrant	21	17.5	126	<i>pending</i>
May-2003	Redfish Lake Creek	Weir, AD out-migrant	20	18.4	127	<i>pending</i>
June-2003	Redfish Lake	Hook and line/creel, wild/natural <i>O. nerka</i>	9	NA	NA	<i>pending</i>
July-2003	Redfish Lake	Hook and line/creel, wild/natural <i>O. nerka</i>	7	NA	NA	<i>pending</i>
July-2003	Alturas Lake	Hook and line/creel, wild/natural <i>O. nerka</i>	2	NA	NA	<i>pending</i>
09/24/03	Redfish Lake	Trawl, age-0 wild/natural <i>O. nerka</i>	17	4.5	76	<i>pending</i>
09/24/03	Redfish Lake	Trawl, age-1 wild/natural <i>O. nerka</i>	3	17.5	122	<i>pending</i>
09/24/03	Redfish Lake	Trawl, age-2 wild/natural <i>O. nerka</i>	2	38.3	148	<i>pending</i>
09/24/03	Redfish Lake	Trawl, age-3 wild/natural <i>O. nerka</i>	1	136.4	231	<i>pending</i>
09/24/03	Redfish Lake	Trawl, age-4 wild/natural <i>O. nerka</i>	1	155.8	240	<i>pending</i>
09/25/03	Pettit Lake	Trawl, age-1 wild/natural <i>O. nerka</i>	8	25.1	126	<i>pending</i>
09/25/03	Pettit Lake	Trawl, age-3 wild/natural <i>O. nerka</i>	4	108.9	204	<i>pending</i>
09/26/03	Alturas Lake	Trawl, age-0 wild/natural <i>O. nerka</i>	5	2.8	66	<i>pending</i>
09/26/03	Alturas Lake	Trawl, age-1 wild/natural <i>O. nerka</i>	2	10.1	106	<i>pending</i>
09/26/03	Alturas Lake	Trawl, age-2 wild/natural <i>O. nerka</i>	3	49.2	164	<i>pending</i>
09/26/03	Alturas Lake	Trawl, age-3 wild/natural <i>O. nerka</i>	5	61.5	181	<i>pending</i>
10/02/03	Sawtooth Fish Hatchery	Pre-release, AD sockeye salmon presmolt	21	106.0	11.7	<i>pending</i>

<sup>a</sup> AD refers to an adipose fin-clip and RV refers to a right ventral fin-clip.

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September 5, 2003

**M E M O R A N D U M**

**To: SBSTOC**

**From: Paul Kline, Dan Baker, Carlin McAuley, Jeff Heindel,  
Catherine Willard**

**Subject: 2003 Sockeye Salmon Spawning Matrix**

At IDFG and NOAA facilities in 2003, the primary rearing group to reach maturity will be age-3 fish produced in brood year 2000. In addition, a small number of age-4 BY99 males and a yet to be determined number of age-2 BY01 males are expected to mature.

Following examination of broodstocks by ultrasound at Eagle Fish Hatchery on 8/8/03 and NOAA Burley Creek Hatchery on 6/26/03, the following numbers of maturing and immature fish are in culture:

Eagle BY99

Maturing females = 0  
Maturing males = 7  
Immature fish = 0

NOAA BY99

Maturing females = 0  
Maturing males = 2  
Immature fish = 1

Eagle BY00

Maturing females = 228  
Maturing males = 96  
Maturing unk. = 0  
Immature fish = 4

NOAA BY00

Maturing females = 193  
Maturing males = 100  
Maturing unk. = 2  
Immature fish = 12

Eagle BY01

Maturing females = not yet determined  
Maturing males = not yet determined

NOAA BY01

Maturing females = unknown  
Maturing males = Approx. 20

BY99 Lineages:

Fifteen specific family groups (lineages) were initially developed in 1999; 11 family groups were selected to create the BY99 broodstock. Seven of the 15 groups were developed from the

three hatchery-produced, anadromous, age-3 “jacks and jill” (ANH99) that were incorporated in the spawning design. Age-3 anadromous returns were produced from program production crosses in BY96. Two mitochondrial DNA haplotypes are represented (H9 and H25). Anadromous fish were crossed within group and out-crossed with BY96 and BY97 broodstock fish. The eight remaining major broodstock subfamilies produced in 1999 were between BY96 and BY97 broodstock adults.

Brood year 1996 production fish were generated primarily from first generation progeny of the eight wild, anadromous adults that returned in 1993. Brood year 1996 broodstock fish were produced from the single wild, anadromous female that returned in 1996; first generation progeny of the eight wild, anadromous adults that returned in 1993; and 1991 and 1993 wild, Redfish Lake out-migrants. Brood year 1997 broodstock fish were produced from the single wild, anadromous female that returned in 1994 and first generation progeny of the four wild, anadromous adults that returned in 1991. In addition, cryopreserved milt from 1991 and 1992 out-migrants was used.

Note: The majority of adults from this broodstock spawned in 2002. Four of the original 15 lineages are represented in the seven males still on station at the Eagle Fish Hatchery.

#### BY00 Lineages:

The majority of fish from this group represent a variety of spawn crosses and are related to the hatchery-produced anadromous adults that returned in 2000, and the wild, anadromous adults that returned in 1992, 1993, 1994, 1996, and 1998. Wild, Redfish Lake out-migrants from 1991, 1992, and 1993 are also represented in this broodstock.

Sixteen families, represented by 49 unique sub-families, were developed from brood year 2000 spawn crosses at the Eagle Fish Hatchery; 10 family groups were selected to create the BY00 broodstock. To simplify tracking, families were grouped under two production group titles: BY00 and ANHBY00. The BY00 group was developed using male and female sockeye salmon from the BY97 and BY98 broodstocks. Specific crosses performed to develop this production group included: 1) BY97 females x BY97 males, 2) BY97 females x BY98 males and 3) BY98 females x BY97 males. The ANHBY00 production group was developed using male and female sockeye salmon from BY97 and BY98 broodstocks and 38 (18 females and 20 males) of the 41 anadromous adults that returned to the Sawtooth Valley in 2000 and were retained for spawning. Specific crosses performed to develop this production group included: 1) ANH00 females x BY97 males, 2) ANH00 females x BY98 males, 3) ANH00 females x ANH00 males and 4) BY97 females x ANH00 males.

#### BY01 Lineages:

Sixteen families, represented by 86 unique sub-families, were developed from brood year 2001 spawn crosses at the Eagle Fish Hatchery; eleven family groups were selected to from the BY01 broodstock. To simplify tracking, families were grouped under two production group titles: BY01 and ANHBY01. The BY01 production group was developed using male and female

sockeye salmon from the BY98 and BY99 broodstocks. Specific crosses performed to develop this production group included: 1) BY98 females x BY99 males and 2) BY98 females x BY98 males. The ANHBY01 production group was developed using male and female sockeye salmon from the BY98 broodstock, male sockeye salmon from the BY99 broodstock and 9 (2 females and 7 males) of the 26 anadromous adults that returned to the Sawtooth Valley in 2001 and were retained for spawning. Specific crosses performed to develop this production group included: 1) ANH01 females x BY98 males, 2) ANH01 females x BY99 males, and 3) BY98 females x ANH01 males.

#### 2003 Anadromous Returns:

At the time of this writing, two sockeye salmon (one male and one female) have been captured at Sawtooth Valley trapping locations (both on Redfish Lake Creek). While specific lineages will be difficult to identify, mtDNA and nDNA markers will be used to genotype both adults. At this time, it is our recommendation that both adults be retained and incorporated in the hatchery spawning design at the Eagle Fish Hatchery.

#### Proposed Spawning Design:

The following spawning design was developed to guide both IDFG and NOAA staff with year 2003 spawning activities. The plan takes into account pedigree information for captive fish and genetic marker information for hatchery-produced anadromous adults and has been designed to minimize the risks associated with inbreeding. Note: at the time of this writing, genetic information for anadromous returns was still pending.

Spawn preference matrices have been developed for crosses between BY00 females X BY00 males, BY00 females X BY99 males, and BY00 females X BY01 males. Again, the primary cross type that will be made in 2003 will be BY00 females X BY00 males.

Each of the three cross preference sheets (attached) contains two tables. All tables list males along the left margin and females across the top. The first table of each sheet identifies the number of lineage groups originally produced for each broodstock (e.g., L1 through L10 for the BY00 broodstock, L1 through L15 for the BY99 broodstock, and L1 through L11 for the BY01 broodstock). The percentages identified in each cell of the first table reflect pedigree overlap (with respect to wild, founding contributors) for each specific cross. For example: a value of 50% indicates that male and female spawners share 50% of the original broodstock founders (e.g., wild anadromous, out-migrant, and residual fish) in their immediate pedigrees. Similarly, 50% of the original founders used to develop these two lineages do not overlap.

Note: Original founder groups and their representation in the BY00 broodstock at the grandparent through great-great grandparent level are presented in a table following the three spawn preference matrices. The letters A through W have been used to represent the 23 original, wild contributors to the captive population.

The second table of each cross preference sheet identifies the number of individual fish (by

lineage) in the IDFG component of the program expected to mature in 2003. In addition, the designations: 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> are used to identify the proposed hierarchy of spawn preferences for this year. First-tier crosses represent 50% or less pedigree overlap between males and females. Second-tier and third tier crosses represent 51% to 70% and 71% to 100% overlap, respectively.

To incorporate all individuals in the spawning design, 1<sup>st</sup> and 2<sup>nd</sup> tier crosses will be emphasized in 2003. This is especially true for crosses performed between BY00 males and BY00 females. Crosses performed between BY99 males and BY00 females as well as between BY01 males and BY00 females will have more latitude to emphasize the 1<sup>st</sup> tier level. Third tier crosses will be minimized but performed if specific individuals are at risk of not being represented in the spawning design. By avoiding “same lineage” crosses (e.g., L1 x L1 etc.), potential sibling crosses will be avoided.